Claims

1. An illuminator comprising an array of light sources mounted in cavities in a substrate, and an electrical drive circuit, wherein the substrate comprises an electrically insulating body plated with conductors for the drive circuit.

2. An illuminator as claimed in claim 1, wherein the substrate body is of a circuit board material.

3. An illuminator as claimed in claim 2, wherein the substrate body is of FR4 material.

4. An illuminator as claimed in any preceding claim, wherein the conductors extend into the cavities to also act as reflective coatings on the cavity walls.

5. An illuminator as claimed in claim 4, wherein the conductors extend underneath the light sources.

6. An illuminator as claimed in any preceding claim, wherein the light sources are bare semiconductor die.

7. An illuminator as claimed in any preceding claim, wherein the illuminator further comprises a thermally conductive structure under the light sources.

8. An illuminator as claimed in claim 7, wherein the thermally conducting structure comprises a plurality of layers bonded to a surface of the substrate body.

9. An illuminator as claimed in claim 8, wherein the thermally conductive structure comprises a heat spreader in direct contact with a plating under a light source.

10. An illuminator as claimed in claim 9, wherein the heat spreader comprises a metal plating patterned onto the substrate under each cavity.

11. An illuminator as claimed in claim 10, wherein heat spreader comprises a plurality of metal coatings patterned onto the substrate, one under the other.

12. An illuminator as claimed in any of claims 9 to 11, wherein there is one heat spreader per light source.

13. An illuminator as claimed in any of claims 7 to 12, wherein the thermally conducting structure comprises a global thermally conducting layer underneath all of the cavities.

14. An illuminator as claimed in claim 13, wherein said global layer comprises a resin embedded with thermally conductive particles.

15. An illuminator as claimed in claim 14, wherein the particles are of diamond material.

16. An illuminator as claimed in claim 14, wherein the particles are of a ceramic material such as Boron Nitride.

17. An illuminator as claimed in any of claims 13 to 16, wherein the thermally conductive structure further comprises a heat sink bonded to the global layer.

18. A method of producing an illuminator comprising the step of:

providing a substrate body of insulating material,

completing a substrate by plating the body with an electrically conductive plating;

forming an array of cavities in the substrate at a top side, the cavities having a shape for desired light reflection; and

placing a light source in each cavity.

19. A method as claimed in claim 18, wherein the plating of the substrate is patterned after the cavity-forming step to both provide the drive circuit and optically reflective coatings on the walls of the cavities.

20. A method as claimed in claims 18 or 19, wherein the substrate is plated with metal on an underside, and each cavity is formed through the full depth of the substrate body to expose the plating on the underside.

21. A method as claimed in any of claims 18 to 20, wherein the cavities are formed by drilling.

22. A method as claimed in any of claims 18 to 21, comprising the further steps of applying a thermally conductive structure to the underside of the substrate.

23. A method as claimed in claims 21 or 22, wherein the thermally conductive structure is applied to the platings under the cavities and exposed substrate surfaces therebetween.

24. A method as claimed in claim 23, wherein an additional metal layer is applied to the platings before application of the thermally conductive structure.

25. A method as claimed in claims 22 to 24, wherein the thermally conductive structure comprises a layer of resin impregnated with thermally conductive particles.

26. A method as claimed in claim 25, wherein a heat sink is applied to said layer.

27. A method as claimed in any of claim 26, wherein the heat sink and the resin layer are applied with use of adhesives and pressing.